

OCT. -14-1897
596

A FEW WORDS ABOUT ANTHROPOMETRY. ✓

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I.

Several articles have appeared of late, particularly in the AMERICAN JOURNAL OF INSANITY, discussing the application of anthropometry in the study of abnormal classes and especially in that of the insane. This shows that there is a growing interest in this comparatively young branch of science in this country, and at the same time a tendency to utilizing it in investigations of a pathological order, in certain departments of pathological anatomy of the human body, where it will soon, doubtless, prove of much service. The interest once aroused will grow steadily, for anthropometry will soon demonstrate itself as a good diagnostic and probably a prognostic help; besides this, the work itself is most interesting. It will not be many years, I believe, before the method will be a part of the routine examination in all our prominent institutions for the abnormal classes of every kind, for there are whole groups of important structural characters, particularly the inherited and congenital ones, which can not be satisfactorily determined by any other method.

But in order that anthropometry should meet with full success, and gain in proper time the place it deserves in medicine and in the study of human abnormalities in general, there are a few precautions necessary. It is necessary right now, at the beginning of the era of the procedure with us, to have clearly defined its nature, and to well understand its advantages, and at the same time to be aware of the dangers of its possible misuses, for there exists such dangers. Anthropometry is an extensive and a delicate method. It is full of rewards in the shape of information for him who uses it properly. But it requires to be plainly appreciated by every one who would make any valuable practical application of it, or it may prove a sword with a double edge, may occasion much loss of time, much embarrassment, and even disappointment, to the investigator, and in addition become itself subject to much undeserved prejudice in the future.

I have thought it would be well, at this stage of the use of the method with us, when the intention of trying measuring practically

VOL. LIII—No. IV—C

presented by the author -

is becoming perhaps with many a serious consideration, to say a few words about it. A warm friend of anthropometry, I would like to see its study advanced and its methods used as much as possible, but at the same time it ought to be done full justice. I shall not enter into any exhaustive and minute considerations; the time is not opportune for such; the best way will be probably to give, in the first place, a brief, general outline of the method, of its history and present status, and to conclude with a few such explanations and indications as appear to me for the present the most important.

II.

The measuring of man originated with the artist, became in time the special province of the anthropologist, and is now being adopted by the sociologist and the physician.

The human figures on the very oldest Egyptian columns seem to show a certain regulation of proportions. The Greeks sculptured their beautiful statues on bases of well-known measurements of the body, systematized into a so-called Greek canon. The Romans followed the Greek example. After the Romans, however, and during the whole Middle Ages, anthropometry was neglected. The old canons were often forgotten, even by real artists, and received no change, no addition. At the end of the fifteenth century Spigel re-commences to take some measures on the head. After the Renaissance, Daubenton (1764) makes the first serious application of craniometry. Then came Camper, a student and great friend of art, in about the middle of the eighteenth century (1722-1789). Examining the works of his contemporaneous artists, and particularly pictures, he noticed almost constantly that the figures of the paintings do not correspond to the natural scales; that short limbs are given to long bodies, or the reverse; women's features to men, those of white men to negroes, etc. This aroused Camper, and he decided to restudy the old methods. This achieved, he began to measure himself, traced out soon some racial differences, defined the facial angle, and introduced a method of obtaining the same, and gave by his work a great incentive to anthropometry in general. Camper was followed by Blumenbach, a German physician and naturalist, who lived at the end of the last and during the first part of this century (1753-1840), and who applied anthropometry to the study of man and his races for anthropological purposes; and on these few men we may look as at the pioneers of our whole present system of measurements.

After Camper and Blumenbach the history of anthropometry belongs all to the present century. Taken up by the great naturalists of the first half of the century, it rapidly extended to all students of the human body, and the anthropologists in particular. Its hot-bed was France, but England and Germany quickly followed. The method soon proved of such value, especially so in the researches on mankind, that it won the attention of many great minds, and was speedily brought to considerable detail and precision. It is due to anthropometry that we have to-day so much of positive knowledge about man's natural history and about the varieties of mankind, both in the past and the present; and it is due to the same cause, to a large extent, that we have advanced so much in zoölogical differentiation.

So much for the origin of anthropometry. With the advent of the last decade of this century we find the measuring methods almost perfected. By their means every important race or nationality is defined, while the same is being attempted with others less important. Old views of races have been cleared and changed, and the nations are shown to be generally, to a greater or lesser degree, mixtures, and never entirely pure ethnical groups. At the present, the laws of physical acclimatization, the influences of racial admixtures, and the effects of heterogeneous unions are considered, and being largely determined by measurements. At the same time a most important new step is being made, namely, an effort, after having separated and defined races, to differentiate individuals. Each race, every nation, every community presents recurringly individuals who present characters and tendencies differing much from the average of the whole ethnic group, and it is on these classes that anthropometry begins to essay at present its virtues. The Italians began here, and lead now with the French scientists. The new programme is, after being able to define the human normal, to separate the abnormal from the normal, and to classify, if possible, the abnormal. And it is here, in this its latest application, where anthropometry encounters the domain of medicine. As an aid in determining the abnormal in man, it serves both the general student of mankind and the clinician, and they really join hands at this point, the anthropologist and the physician.

III.

Before proceeding any farther, let us see what the new aid of science substantially is, and what it can do.

Anthropometry is only a method of procedure; it is a knowledge of certain instruments and an art of obtaining, by the help of these instruments, certain data on the human body or organs—and nothing further. Hence, the first axiom is: anthropometry, in its greatest perfection, will give the physician nothing but bare measurements, and any signification of the data it may furnish will always correspond to the physician's powers of judgment and discrimination.

We find, however, two great laws underlying measurements on man in general, and these laws are destined to become permanently the two great sources of indications to the investigator.

The first of those laws is that of symmetry of the two sides of the body. In every normal individual the external measurements of his right and his left side, or the external parts to the right and to the left of an imaginary antero-posterior plane, which divides that individual in the middle in his length, are, within certain limits, equal. These limits known, anything beyond them, above or underneath, is abnormal, and it only remains for the diagnostician to decide on the nature and value of this abnormality.

The second and the more extensive law is that of equal proportions of an individual with reference to his normal standard.

Every family of the human race—in other words, every variety of mankind, every ethnological group—has its average physical proportions, which can be looked at as its normal standard. The normal proportions are never simple measurements, but vary within certain limits, and they apply to all the organs, the internal as well as the external. To understand the normal proportions, a certain insight into anthropology is necessary. When fully comprehended in a given case, everything found in that case beyond, below or above the limits of the normal standard, is a disproportion, and as such again a basis for the diagnostician.

With the above two laws, which underly all measurements, there could be much achieved, provided, however, that (*a*) the whole method of measuring were perfect and uniform; (*b*) that the instruments were perfect and easy of handling; and (*c*) that every one who would measure, would start thoroughly acquainted, in theory and practice, with both the instruments and the procedure. Unfortunately, as things are, there remains considerable to be desired with reference to each of these points, and particularly so with us in this country.

The methods of measuring are highly developed, and even

though not perfect, they would suffice for all ordinary requirements. But as to uniformity, we find that there exists not one, but in reality several, or at least a couple of methods; methods which differ considerably one from the other, and differ so much, indeed, that data obtained by one method are often almost irreducible into those of the other, and beyond the possibility of comparison. This is a serious fact and confronts us in the very start. There are two main schools of anthropometry, the French and the German. We can not follow the method of both these schools at once, and it would not be advisable, and would hardly be possible, to choose an abstract of both and form a new method. Yet we have to choose some *one* procedure. If we do not, the efforts of that part of us who may follow one way of measuring will be lost with those who would follow a different method, and *vice versa*. The difficulty which confronts us here is a serious one, and to overcome it will be impossible except by a common understanding and consent among all the investigators who are to make use of anthropometry in this country. Such an understanding can be arrived at through the press, or perhaps through the means of a convention. Unless one method be generally adopted with us, we shall soon find ourselves in a condition similar to that in which the ophthalmologists, for example, would soon be, should there arise among them two or three radically different methods of eye-examinations, and each with its own nomenclature.

The second condition of success in our work will be good instruments. There are many and various instruments for measuring in existence, and new ones are still being put on the market. No one of these instruments is probably without its point of value in some particular direction, but it is equally true that in many of the instruments this point of particular value is accompanied with and offset by many disadvantages, the main among which are high price, complicated mechanism, and inaccurate scales of measures. The best instrument is one which is most accurate, lasting, cheap, and simple at the same time. It really does not matter so much of what particular make or invention the implement is, but it ought to possess at least a majority of the above requisites. A higher price would, perhaps, be the least obstacle to overcome, though it interferes considerably with the generalization of the method; but to work with instruments which are difficult of manipulation, or with such as may be unreliable, means nothing but a great loss of time, a great trial of patience, and finally a discouragement to the

investigator. We, in this country, are not yet so fortunate as to possess the complete anthropometric outfit answering to all the named requisitions; but we have a large number of most able instrument-makers, and I have no doubt but that instruments equal to the best from abroad can and will be produced here—if the best qualities, namely, simplicity, accuracy, and a moderate price, will be the general purchase conditions of those who would measure.

The third and the most important condition of valuable work and progress in anthropometry, is an efficient, special, practical education in the method of all those who would follow it. It is useless to try to measure and hope the results of the work may be recognized without an initial thorough training in the procedure. There are things for the proper learning and practice of which a genius suffices, but anthropometry is very exceptionally such. It is easy, no doubt, to take the distance between two fixed points; indeed, I may say, between any two fixed points, of an object which is well within our powers of manipulation. But the human body is a curious object, with points always to be fixed anew, with unstable surfaces above many of the landmarks, and with numbers of irregularities which constantly disturb the simplicity of such a procedure as measuring. The human figure will not be subject to any rules; it requires frequent exceptions, and all method of obtaining properly its dimensions must be in a considerable part an intellectual, a judgment procedure; and how can such discriminating skill be gained otherwise than by a good, preliminary, general understanding of the whole subject? The physician is particularly in a position to be tempted in this phase of anthropometry, as he knows so much of the human anatomy. He has a great advantage over other students of the method in this his anatomical knowledge; that point can be admitted; but let the physician reflect a little on the nature of the requirements of the method, and he can not conscientiously but find that even *he* needs a special training to be able to measure properly. The physician knows many of the anthropometric landmarks, but he does not know them all—does not know all their possible variations, and is not certain of the ways in which to surmount the difficulties arising from such variations. He knows much less the instruments and the manipulations themselves; and, last of all, he lacks completely that practice with the instruments which is absolutely essential in order that his results may be homogeneous with those obtained by other workers in the same line, and be capable of comparison or union with

these other results. All these, I believe, are sufficient reasons to demonstrate that even a physician needs a special anthropometrical training before he can start an independent work in that line and hope that his results in measuring will not be lost.

A much more difficult task than to prove that a preliminary training is really necessary for the practice of anthropometry is to indicate how such a training is obtainable with us. France has its great Broca's laboratory and several anthropological schools with large faculties; Germany has its museums and some teachers; but we are just in the beginning, and have no organized school yet where anthropometry would be taught, and have but few competent instructors. The would-be student of anthropometry in the United States is at a disadvantage when compared to the same class of students abroad. There are only two ways open to the American student—he must either seek a private teacher or go for a course to Europe. Fortunately, everything indicates that there will be an improvement in this state of affairs, and that before long. There are several foci of anthropologists in various stages of formation over this country—one such a group in Chicago, one in Philadelphia, one in Washington, and one in New York, and a starting of a school for anthropometrical instruction in one or another of these places is a matter of the not distant future; and there is the New York State Pathological Institute, the anthropological department of which, it shall be my endeavor, will open in time its doors for instruction. I believe that within half a dozen years it will not need to be any more anyone's excuse that a proper preliminary anthropometric training could not have been secured before starting the work.

IV.

Now, how shall the new method be best taken up and utilized by the medical man, providing he can secure the proper preliminary instruction?

It is plain that measuring the body of the patient can not be of equal importance or prove of equal value to every physician. Not considering any extremes, it is very doubtful if, for instance, a dermatologist, or an eye or ear specialist, could derive much benefit from measurements. With the gynecologist, the obstetrician, and particularly the surgeon, the case is already different, for at times the knowledge of the proportions of the parts they handle may be of considerable consequence. The general practitioner will surely

be benefited now and then by recourse to the method, for certain measures may have an undeniable bearing on his opinion. But undoubtedly the greatest value of the procedure is reserved for those, first, who occupy themselves more or less directly with the human form, and these are the workers in normal and in pathological anatomy; and, above all, for those, who consider the body, outside of accidents, a plastic representation of the influence of the nervous centers on other organic tissues, an exact resultant of the inherited biotic powers, with their acquired modifications—and, on the other hand, consider the nervous system modifiable by certain gross changes of forms produced by extraneous circumstances. These scientists have a special inducement to inquire into the significance and as to the indications which the physical manifestations of the organic forces may have and give as to the state of the organs where such forces are generated, namely, the nervous system, and to seek the relations of changes of form to the modifications of this important system, and particularly its central portion.

This last class of scientists comprises naturally those who deal with individuals who are subject either to one or the other, or all, of the following conditions: With individuals who were either primarily in possession of an imperfect nervous system—and by primarily I mean at the moment of conception; or with those in whom the normal evolution of the nervous system has been interfered with at any time before each organic center has reached the level of its particular function; and with those whose normal and fully developed centers were in some way materially interfered with or destroyed. These are three quite distinct classes of neuropaths, and we can conveniently term the individuals of the first class the neuropaths by a defect of inheritance; those of the second, the neuropaths by a defect of evolution, and those of the third class the neuropaths by accidents. A large secondary class is constituted by mixtures of two or all three of the above conditions. The effects of a neuropathic condition of any kind tend mainly in three directions: They bring the individual either to the neurologist or into an insane asylum, or drive him toward a prison or vagabondage. And hence it is to the neurologists, to the alienists, and to the criminologists and sociologists, that the physical indications of neuropathy, particularly precise measurements, will be of most value, and it will be to these scientists that anthropometry will bring the greatest returns.

V.

The last section of my article will be best dedicated to the question: Which of the many measurements on man adopted and practiced by different investigators, and how many out of the whole number, will be of the most use and value to the physicians, particularly to those mentioned the last above?

To make *all* the measurements on man is simply out of the question, for their numbers reach, with some scientists (Török, in Budapest, for instance) into thousands. Even a very sober anthropologist finds important many measures which would be of no consequence to the physician. I will append a little farther on, as an illustration, my anthropological scale used at the Institute. This scale is only fairly complete; it does not include any delicate measurements of asymmetries, for instance, and others of very difficult securing or of secondary weight, or those obtainable only on the skull or the skeleton. Nevertheless, this example will amply demonstrate the difference of the purely anthropological interests and those of the physician, which are of a more practical nature, and the necessity for the medical man of choosing only the most appropriate measurements from the whole scale for his own purpose. The specialist in the study of mankind secures a great number of measurements simply for ethnical comparisons; the physician, on the other hand, wants to know if an individual, his subject, is or is not, in his most important points, from a medical point of view, normal. An important matter from an anthropological standpoint is any such a point which helps to differentiate a class of human beings from other classes, and particularly the various tribes of people, one from the other. To a physician, the most important points are those which, isolated or together, would prove his patient to be abnormal, and next, those, if possible, which would show to what group of abnormal individuals of the same people does this patient incline. Any point on the body may prove useful for ethnical differentiation, any measurements almost, from those of the head to those of the calf and gluteal region, and it is on this account that an unknown individual has to be subjected by the anthropologist to so many measurements. On the other hand, to show an abnormality, it suffices to take exact measurements only of those regions which most concern the physician in question. The obstetrician needs to measure the pelvis, the surgeon a part or two of the body, and a simple inspection suffices for the rest. To the neurologist, the main parts of the body are the head and the

facial region, and unless he desires to fully corroborate or complete the data obtained from those parts by others, he, too, can find almost everything else that may be of importance to him by simple inspection. According to these specific needs of each one, short and effective schemes of measuring should be chosen and followed. No objection would be thought of, of course, if any individual investigator desired to extend and make more thorough his work. But I believe that only the above mentioned precautions will make anthropometry as useful to the physician as it really can be to him, and free the method for him from qualities which would soon prove it to be both expensive and cumbersome.

I place here for example the scheme of anthropological measures of the State Pathological Institute, New York:

STATE OF NEW YORK—STATE COMMISSION IN LUNACY.

PATHOLOGICAL INSTITUTE—DEPARTMENT OF ANTHROPOLOGY.

Institution.....	Case No.....	Acc. No.....
Name	Diagnosis.....	
Sex	Previous occupation.....	
Age	Nationality.....	{ F.....
		{ M.....
Present state.....	Strong.....	
Good nutrition.....	Medium.....	Feeble..... Emaciated.....

MEASUREMENTS.

Heights:	Circumferences and Arcs:
Height, total	Neck
Vertex.....	Thorax at axilla (mean).....
Auditory meatus.....	Thorax at xyphoid (mean).....
Nasion	Waist, min.....
Chin	At umbilicus.....
Acromion	At pubis.....
Elbow (rad-hum).....	Thigh, max.....
Wrist (styl-rad).....	Thigh, min.....
Medius (flesh end).....	Leg, max.....
Sternum (fossa).....	Leg, min.....
Nipple (mean).....	Arm, max.....
Umbilicus	Forearm, max.....
Pubis (upper border).....	Wrist, min.....
Ant. iliac spine.....	Head, circumf., max.....
Great trochanter	Nas.—inion
Knee (bet. fibula and femur).....	Supraaur. pts.—forehead
Ischia-vertex	Supraaur. pts.—crinion.....
End of styloid of tibia.....	Supraaur. pts.—bregma.....
End of styloid of fibula.....	Supraaur. pts.—max.....
	Supraaur. pts.—point max.....
	Supraaur. pts.—chin

Distances:

Arm—expanse
Biacromial
Nipples
Chest in axilla { a-p.
{ lat.
Chest at xyphoid { a-p.
{ lat.
Iliac crests
Biiliac
Bitrochanteric
Waist, min. { a-p.
{ lat.
Ant. post. at pubis

Diameters, etc.:

Head, antero-post., max.
Lateral, max.
Crinion—pt. max.
Biauricular
Frontal, min.
Biamalar
Bigonial
Chin—vertex, max.
Chin—crinion
Malar, max.
Nasion—crinion
Separ. of ext. canthi
Separ. of int. canthi

Facial angles:

Nose—height
Nose—breadth
Lips—length
Lips—height
Ears—height { L.
{ R.
Ears—breadth { L.
{ R.
Ears—upper half { L.
{ R.
Ears—lower half { L.
{ R.

Indices:

Cephalic
Nasal
Forehead
Lips
Ears { L.
{ R.
Thorax
Pelvis
Hand—index of palm
Hand—length of medius
Foot—length, max.
Foot—breadth, max.
Foot—breadth, min.

Measurements of the roof of the mouth

A few words in conclusion of this my general paper. These few words are designed to be a little more direct warning in certain directions, and to lay down a few useful rules.

Some hospitals for the insane have been lately adopting large schedules of measurements to be taken on the insane, and it seems to me this is a field in which we ought to be particularly careful. It should not be forgotten, I repeat once more, that only a small part of anthropometry can ever be useful in the study of neurology, including alienation, that the majority of measurements on man apply only to his zoölogical and ethnological characters, and can not generally determine his anomalies or pathological changes, and that a great percentage of the measurements is impracticable on a patient, and especially on a woman. What is the use of burdening an otherwise necessarily long and tedious examination of the

insane with a number of procedures which can never be of much practical importance, and which serve only to disparage, and even make ridiculous, the whole otherwise valuable proposed schemes in the eyes of many not directly concerned? If the necessity of measuring is sufficiently recognized, very well; introduce the method into the general examination; measurements are bound to have there a permanent and prominent place in future; but introduce none, at least not in the beginning, but the most important measurements. I shall mention no special instances which might have called for these words, and trust these few remarks may be taken as a warning against harmful tendencies with anthropometry in general.

Two more points call for a brief discussion, and they are the Bertillon system and the camera, and their relations to anthropometry.

The Bertillon system was invented by Alphonse Bertillon for the purpose of identification of criminals, and since its first adoption in Paris (1882) has rendered the police some splendid service. This is what the examination consists of:

Height		
Arc	Head	{ length, max.
Spread of arms		{ breadth, max.
Circumf. of thorax		{ bizygom, max.
Left foot	Right ear
Left medius	Colors	{ No. of color
Left auric.		{ aureola
Left elbow	of iris	{ periphery
		{ misc.

Age

Born

18

In

Department

Apparent age

Two photos, one face, one profile, both taken in the anthropological planes.

Hair

Beard

Color (of skin)

Carbon impressions of the right thumb, index finger, medius, and ring-finger.

No. Name and first names

Surnames and pseudonyms

Born

18

in

Canton

Department

son of

and of

Profession

Last residence

Papers of identity

Connections	Military services.....
Anterior condemnations {	No.
	causes
	places
Present detention, specification of crime.....	
Special remarks as to measurements	
Particular marks and scars.....	

It will be seen at the first glance from the chart, that measurements are only one of the aids of the examination, and it will be found further, that only such measurements are included as are subject to the least variation in the adult, without any regard to their medical or other importance. Whatever measurements are taken, the data, when accumulated from large numbers of cases, will be valuable; but the scheme is deficient for a physician. Bertillon's system is serving admirably its purpose, but should not be expected to go much farther.

Photography is one of the most valuable adjuncts to anthropometrical examination, provided the pictures are taken all in the same established planes and in the proper manner. It is useless, it is little more than a plaything, to take pictures in the ordinary manner; they never can serve a scientific purpose; but even the most properly taken photographs should not be expected to yield any accurate measurements, and should not be subjected to any further scientific use than comparisons. The use of screens with meshes of known dimensions obviates the difficulties no more than other devices; there always remain yet the natural and the accidental shades, the inaccurate distances of all points, and the imperfections of the instruments, conditions which unite to render more than doubtful the reliability of any measurements taken on pictures.

A few points from this paper as advice with which to finish :

1. Be properly instructed, whoever starts to measure.
2. Use instruments which are both simple and absolutely reliable.
3. Follow the most general and recognized method of measuring.
4. Do not take too many measurements.
5. Do not include every new measurement invented.
6. Follow not Bertillon's system; its value lies only in identification.
7. Do not rely on measurements taken on a photograph. And,
8. Always supplement measures by a good inspection.